that the dangers of acetylene are not such as to outweigh its advantages as an illuminant. They add that by simple precautions, such as the slow transference of the compressed gas from vessel to vessel, and the careful cooling of the vessels in which the gas is being compressed, the dangers which they have explained may be easily avoided.

The comfort afforded by these concluding remarks is somewhat abated by the fact that the explosion at M. Pictet's factory was subsequent to the publication of MM. Berthelot and Vieille's memoir. There is no occasion for panic, but the matter evidently demands the most careful attention from the authorities in this as well as in other countries. A. SMITHELLS.

THE PRINCETON SESQUICENTENNIAL.

THE celebration of the one hundred and fiftieth anniversary of the founding of Princeton University, held October 20-22, was doubtless, in some respects, the most brilliant and impressive academic event in all American history. Certainly no other celebration can be compared with it than the Harvard Quarter Millennial of 1888. Most of the leading universities, and many of the smaller universities of America, sent their president; Harvard, Cornell, Columbia, Chicago, Johns Hopkins, Pennsylvania, and Toronto were thus represented. Of the great universities in the United States, Yale alone sent a delegate other than the President, who is now abroad.

The visiting delegates from Europe delivered a series of lectures the week before the anniversary exercises. Prof. Edward Dowden, of Dublin, gave six lectures on "The French Revolution and English Literature"; Prof. Felix Klein, of Göttingen, gave four lectures on "The Mathematical Theory of the Top"; Prof. J. J. Thomson, of Cambridge, four on "The Discharge of Electricity in Gases"; Prof. Andrew Seth, of Edinburgh, gave two on "Theism"; and single lectures were delivered by Prof. Carl Brugmann, of Leipzig, on "The Nature and Origin of the Noun Genders in the Indogermanic Languages"; and Prof. A. A. W. Hubrecht, of Utrecht, on "The Descent of the Primates." Among other foreign delegates were Prof. Henri Moissan, of Paris, Demetrius Botassi, of Athens, and Goldwin Smith, late of Oxford.

Among the proceedings was the unveiling of a table in Nassau Hall, commemorative of the change of name of the University from that of the "College of New Jersey," which has always been its official designation, to "Princeton University," which has already long been its popular designation.

Gifts, amounting to 1,350,000 dollars, have been contributed in honour of the Sesquicentennial, and to mark the change in the Institution's title.

The honorary degree of LL.D. was conferred upon the following delegates, among others:—Wilhelm Dörpfeld, First Secretary of the German Archæological Institute, Athens, Greece; A. A. W. Hubrecht, Professor of Zoology in the University of Utrecht; Felix Klein, Professor of Mathematics in the University of Göttingen; Henri Moissan, Professor of Chemistry in the University of Paris, and Member of the French Academy of Sciences; Edward Baynall Poulton, Hope Professor of Zoology in the University of Oxford; Joseph John Thomson, Cavendish Professor of Physics in the University of Cambridge; J. Willard Gibbs, Professor of Mathematical Physics in Yale University, New Haven, Ct.; Daniel Coit Gilman, President of the Johns Hopkins University, Baltimore, Md.; George Lincoln Goodale, Fisher Professor of Natural History, and Director of the Botanical Garden in Harvard University, Cambridge, Mass.; George William Hill, Member of the National Academy of Sciences, Foreign Associate of the Royal Astronomical Society, West Nyack, N.Y.; William James, Professor of Psychology in Harvard University, Cambridge, Mass.; S. P. Langley, Secretary of the Smithsonian Institution, Washington, D.C.; Joseph LeConte, Professor of Geology and Natural History in the University of California, and President of the American Geological Society, Berkeley, California; John W. Mallet, Professor of Chemistry in the University of Virginia, Charlottesville, Virginia; Silas Weir Mitchell, Philadelphia, Pa.; Simon Newcomb, Nautical Almanac, Navy Department, Washington, D.C.; William Peterson, Principal of McGill University, and Professor of Classics, Montreal, Canada; Ira Remsen, Professor of Chemistry, and Director of the Chemical Laboratory in the Johns Hopkins University, Baltimore, Md.; Henry A. Rowland, Professor of Physics, and Director of the Physical Laboratory in the Johns Hopkins University. The degree was also conferred upon Lord Kelvin and Prof. Otto Struve *in absentia*.

One of the most pleasing and hopeful features of the Princeton celebration was the note of peace and good will to all mankind, which such international gatherings powerfully promote. The first sentiment which called out applause was the hope expressed by President Patton in his opening sermon, that the peace and harmony now happily existing between the two great English-speaking nations might henceforth nevermore be broken; and when in the afternoon of the same day Prof. Thomson, of Cambridge, at the reception of delegates, said that he was glad the revolutionary war had resulted in independence of the United States, as he considered that the best solution of the question, and that England, as well as America, now rejoiced in this outcome of the struggle, the applause was unstinted. WM. H. HALE.

THE OPENING CEREMONY OF THE GATTY MARINE LABORATORY, UNIVERSITY OF ST. ANDREWS.

THE formal opening of the Gatty Marine Laboratory, the general arrangement of which has been already described in NATURE, took place on Friday, October 30, by Lord Reay, a former Rector of the University, in the presence of the Principal and Professors, the representatives of various scientific societies, universities, and colleges, and a distinguished company. In his address Lord Reay paid a tribute to Dr. Gatty for his discriminating generosity. He observed that in countries such as France money was more readily forthcoming for science. He spoke in warm praise of the labours of the late Lord Dalhousie in the cause of the fisheries, and pointed out how important scientific knowledge was in regard to fisheries legislation. Moreover, that whatever revelations science has in store for us cannot be evaded. He was inclined to think that a few central institutions thoroughly well equipped, were better than many incomplete and inefficient schools. The work in the Gatty Marine Laboratory would be of a purely scientific character, but it would be of the utmost value to all who were interested in the prosperity of our fisheries. A glance at the papers published since the opening of the old Laboratory in 1884, showed how essential their contents were for those who wish to protect our fisheries, and who often attempt it in the wrong way. He drew attention to the unique position of the University in regard to the study of marine biology.

Prof. Sir William Flower then followed, and he traced the growth of the study of marine animals during the last fifty years. In former days the zoologist had to depend on the rock-pools, or specimens stranded by storms, or had to work on board ship. Especially he pointed out the development of aquaria from their simplest form to the present great tanks. He then adverted to the growth of zoological stations over the world, and considered that St. Andrews, by its work, had come to be a centre for the study of problems connected with the fisheries. Its laboratory was the first that was fairly established in the British Isles; and while he knew that Edinburgh was often called the Athens of the North, he would now say that St. Andrews had many claims to be called the Naples of the North.

The Dean of the Faculty of Arts then presented the following gentlemen for the degree of LL.D.:—Prof. Sir William Flower, K.C.B., F.R.S.; Rev. Dr. Henry B. Tristram, F.R.S.; Prof. Michael Foster, Sec.R.S.; and Prof. Gustave Gilson, Louvain.

Dr. C. H. Gatty then expressed his gratification at the interest taken in the new Laboratory, and handed to Lord Reay a silver key wherewith to open the door.

Prof. McIntosh, on behalf of the University and the scientific workers, conveyed their thanks to Dr. Gatty for his munificent gift.

Thereafter the Laboratory was inspected by the company. In addition to the living animals in the tanks, the walls of the lobby were hung with coloured drawings of marine animals—enlarged to various degrees, and many beautifully and softly painted—all by the late Mrs. Günther. These drawings consisted almost entirely of representations of living forms from St. Andrews

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Bay, coloured from life. A few were also hung in each room. In the tank-room were various nets (surface, large mid-water and bottom), circular flounder-nets, mussel and other dredges, mussel and cockle implements, Italian eel-spear, hand-nets, scoops, water-telescope, thermometers (surface, deep-sea, and open-air), sieves, and various models of trawls, crab pots, &c. In the Director's room were the multitudes of preparations connected with the life-histories of the food fishes, rare pelagic forms, such as the larval *Polygordius*, *Mitraria*, *Tornaria*, and the wonderful larva of *Luidia*. In the specimen-room were the type-series of the pelagic fauna of the Bay from January to December, an extensive collection of pelagic ova of fishes from various parts of the eastern and western shores of Scotland, a series of preparations connected with the life-history of the salmon, a reference-collection of invertebrates, including an interesting series of the mussels of the Eden, oysters from the Forth and from Whitstable, a series of fishes, and other preparations.

THE INSTITUTION OF MECHANICAL ENGINEERS.

ON the evenings of Wednesday and Thursday of last week, the 4th and 5th inst., an ordinary general meeting of the Institution of Mechanical Engineers was held in London, the theatre of the Institution of Civil Engineers having been lent for the purpose. The President, Mr. E. Windsor Richards, occupied the chair on both evenings.

There were three papers set down for reading, as follows:—

"Research Committee on the Value of the Steam-Jacket; Experiment on a Locomotive Engine," by Prof. T. Hudson Beare and Mr. Bryan Donkin.

"Transmission of Heat from Surface Condensation through Metal Cylinders," by Lieut.-Colonel English and Mr. Bryan Donkin.

"Breakdowns of Stationary Steam-Engines," by Mr. Michael Longridge, of Manchester.

The two first papers were taken on Wednesday, Thursday evening being devoted to Mr. Longridge's memoir.

The Research Committee on the Value of the Steam-Jacket has been in existence for a long time now, and has proved one of the least, if not actually the least satisfactory of all the research committees constituted by the Council of the Institution. Most of these committees have done admirable work, and added largely to the stock of professional knowledge and accumulated data which engineers have to draw. Steam-jacketing is perhaps the most abstruse question which has been made the subject of an inquiry, comprising, as it does, problems extending beyond engineering proper far into the province of physical science. Nevertheless, in the present day of enlightenment, with the professor so widely abroad, more ought to have been done than has been done by this committee. It would be difficult to select an engine more unfitted for making an inquiry upon as to the value of the steam-jacket than an ordinary locomotive. Its rapid piston speed—or, rather, the high rate of turning—alone is sufficient to render it unsuitable for this inquiry; but, in any case, a locomotive is the most difficult engine from which to obtain experimental data. It is an athletic feat of no mean order to take even indicator diagrams, when one has to hang on to the side of an engine travelling at a speed varying from anything up to sixty, or perhaps eighty miles an hour. Then a locomotive, even with constant train load—a condition which can hardly be ensured in ordinary work—is seldom for five minutes at a time exerting the same power, owing to varying gradient, state of the rails, and force or direction of wind—the latter a most important consideration. Steam may be shut completely off when descending a steep bank, or the regulator may be full open and link in the last notch under exactly opposite conditions. Between these two states we have all grades of linking-up, an operation which so affects the distribution of steam—compression, expansion, &c.—that one would think the steam-jacket would finally give its job up in disgust from fair despair of knowing what it should do.

The result of all this is shown in the report, which possesses the merit of being absolutely honest and straightforward. Four trial runs were made between Manchester and York during ordinary working, with its attendant stoppages and delays. The steam-jacket fitted was of a temporary nature, and the method of testing was to make one run each way with the jackets in steam, and a like number of runs with the jackets empty. Coal was weighed and feed-water measured by a Siemens' meter. Mr. Michael Longridge drew off samples of chimney gases for analysis. Jacket-water was also drawn off and measured. Speed was taken by a Boyer recorder, and the revolutions assumed from its records.

In spite of the fact that we know nothing more about the value of the steam-jacket than we did before the experiments were made, the trials added, as a by-product, something to the knowledge of railway engineers on the performance of the locomotive; but, in any case, the thanks of the Institution are due to the authors of the paper for their disinterested labours.

The second paper was a complement to the first; for the rate of transmission of heat to and through metal is the chief thing necessary to be known for determining the value of steam-jacketing of engine cylinders. The problem is a vexed one, and no inquiry yet made has taken us beyond its threshold. The authors have attacked the subject by an endeavour to ascertain the actual temperature in the interior of the metal, and by observing the exact appearance of the film of water deposited, and, further, by determining whether such a phenomenon as cloudy steam really exists. Their apparatus consisted of a strong vertical glass cylinder about $5\frac{3}{8}$ inches in diameter and $2\frac{3}{4}$ inches high. Inside this was placed a metallic cylinder. The annular space between the glass cylinder and the enclosed metallic cylinder was filled with steam, whilst through the interior of the metal cylinder an ascending stream of cooling water was made to circulate. In order to determine the thermal gradients in the metal, when its thickness allowed of so doing, the temperatures of the interior were taken in vertical holes 1/8 or 1/16 of an inch in diameter, drilled at different distances from the condensing surfaces, and filled with mercury, into which slender thermometers were inserted. Illustrations of the apparatus were hung on the walls of the theatre, and will be reproduced in the published volume of the *Transactions* of the Institution. The pressure of steam, volume and temperature, of circulating water, and other trial conditions were controlled by suitable apparatus. The first result arrived at was that the authors consider it was not possible to trace the slightest appearance of cloudiness or mist, or of water suspended in the body of the condensing steam. The water of condensation was deposited on the surfaces. A reproduction was given of a photograph of the film of water on the surface of smooth cast-iron as it appeared through the glass cylinder, the steam pressure being 20 lbs. per square inch, and the rate of condensation somewhat slow.

The velocity of circulating water varied between 0·032 and 0·415 feet per second. The different metallic cylinders tried were made from cast-iron with both rough and smooth surfaces 11/32 and 31/32 of an inch thick, copper, and brass with smooth surfaces 2/32 of an inch thick, and smooth steel 1/32 and 10/32 of an inch thick. The rate of heat transmission was found by observing the rise of temperature in a known quantity of circulating water, and by noting the weight of steam condensed. Corrections were made to allow of accidental losses. Without publishing the diagrams on which the results of the experiments were plotted, it would be impossible to give details of the observed results unless we printed the voluminous tables attached to the papers. The greatest quantity of heat transmitted per second was about thirty-five thermal units, and the least seven thermal units per square foot of internal surface of cylinder. The authors consider that the film of water deposited by condensation, and adherent to a metallic surface, resists the transmission of heat in exactly the same way as an equivalent greater thickness of metal would do. The thickness of the water films, as determined by the difference of temperature, is less on a smooth surface of cast-iron than on a rough one, and is apparently not affected by the admission of steam-jets to sweep the surfaces. There is, the paper says, no apparent difference in the resistance to transmission of heat between the surface-layer of metal and the next to it; or, in other words, there is no drop in temperature on entering or leaving the metal. The thermal gradient at any point in the metal would be uniform in a flat plate, and becomes steeper towards the interior of a hollow cylinder as the circumference diminishes. At any point on the surface of the metal next to the circulating water, the temperature, owing to an adherent film in which the thermal gradient exists, is much in excess of the mean temperature of the circulating water at the same point.

In the discussion which followed the reading of this paper,

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